# CYCLONE VACUUM CLEANER

## BACKGROUND OF THE INVENTION

### 1. Field of the invention

The present invention relates generally to a cyclone vacuum cleaner, and more particularly, to a cyclone vacuum cleaner of which an operation handle can be directly connected to assorted accessory brushes.

### 2. Description of the Related Art

A cyclone is an apparatus for separating particles in a fluid using centrifugal force. The cyclone has been widely used in industrial fields as a dust collector due to its simple structure and durability against heat and pressure. The cyclone is also used in vacuum cleaners.

A vacuum cleaner having a dust collector, as shown in Fig. 1, reduces the amount of dust being collected in a paper filter which is disposed in a main body 30, by gathering relatively large dust which is entrained in air drawn into a cyclone dust collector 20. Therefore, the paper filter disposed in main body 30 can be used for longer periods without requiring cleaning or replacement. In addition, the vacuum cleaner

having the cyclone dust collector 20 enables effective cleaning while simultaneously inhibiting overload on a motor.

A vacuum cleaner having the cyclone dust collector 20 draws in air, including entrained dust and dirt, through a brush 10 and extension pipe 11 of the vacuum cleaner to an essentially cylindrical main body 21 of the cyclone dust collector 20. The air stream enters the cylindrical body 21 an oblique or tangential direction. Accordingly, an air whirlpool or cyclone is generated, and thereby the various dust and dirt entrained in the air are separated by centrifugal force of the cyclone, and are collected in a dust receptacle 22. Air from which dust is removed reverses direction of travel from the bottom of the dust receptacle 22 rotating within a smaller radius and gradually rising toward a central portion at the top of the cyclone dust collector 20, and then is discharged to the main body 30 through an operation handle 23 and a flexible hose assembly 24.

However, it is inconvenient to use a conventional vacuum cleaner having the cyclone dust collector 20 between the extension pipe 11 and the operation handle 23, since an accessory brush (not shown), such as a crevice tool or a dusting accessory, is connected directly to the operation handle 23, and therefore, the area to be cleaned is obstructed by the dust collector 20. Moreover, an extension pipe with a predetermined length is needed to connect the accessory brush (not shown) to the operation handle 23.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved cyclone vacuum cleaner in order to removably connect an accessory brush directly to an operation handle.

In order to achieve the above-described objects of the present invention, there is provided a cyclone vacuum cleaner comprising a main body, a flexible hose assembly extending from the main body, an operation handle, wherein one end is connected to the flexible hose assembly and the other end is connected to an extension pipe for use with a brush which is in contact with an area to be cleaned, a cyclone dust collector for collecting dust disposed between the main body and the operation handle, and a brush to draw in the dust on the area to be cleaned being connected to the operation handle.

According to a first preferred embodiment of the invention, it is preferable that the cyclone dust collector is disposed between the operation handle and the flexible hose assembly.

In addition, according to a second preferred embodiment of the invention, the flexible hose assembly comprises a first flexible hose to be connected to the operation handle and a second flexible hose to be connected to the main body. The cyclone dust collector is disposed between the first and second flexible hoses.

The cyclone dust collector may further comprise a cyclone body for generating

an air whirlpool current with respect to air flowing into the cyclone body, which has an air inlet leading to the operation handle, and an air outlet in fluid communication with the main body, a dust receptacle removably connected to the cyclone body by a locking unit, a first upstream prevention member integrally formed with the dust receptacle, a dust separation grill which is extending downwardly from the air outlet in the cyclone body and having a plurality of fine holes in a surface thereof, and a second upstream prevention member formed at the lower part of the dust separation grill removed from the air outlet.

The locking unit may further comprise a hinge projection formed on the operation handle and a hinge hole formed in the dust receptacle corresponding to the hinge projection.

A connecting end of the dust receptacle, corresponding to a virtual arc of an imaginary circle, having a locus on the hinge projection, the virtual arc on the plane is disposed in a direction perpendicular to a shaft of the hinge projection.

In addition, a cyclone vacuum cleaner according to a third preferred embodiment may comprise a main body, a flexible hose assembly at one end connected to and extending from the main body, an operation handle one end of which is connected to another end of the flexible hose assembly, and the other end of the

operation handle is connected to an extension pipe to be joined with a brush which will be contacted with an area to be cleaned, a cyclone dust collector which is connected to the flexible hose assembly, and the other end is connected to the main body, and a brush for drawing in dust on the area to be cleaned.

The cyclone dust collector may comprise a cyclone body for generating an air whirlpool current with respect to air flowing into the cyclone body, which has an air inlet providing fluid communication to the flexible hose assembly, and an air outlet providing fluid communication to the main body, a dust receptacle removably connected with the cyclone body by a locking unit, a first upstream prevention member integrally formed with the dust receptacle, a dust separation grill extending downwardly from the air outlet in the cyclone body with a plurality of fine holes formed on a surface thereof, and a second upstream prevention member formed at the lower part of the dust separation grill removed from the air outlet.

Further, in a cyclone vacuum cleaner according to a fourth preferred embodiment, the air inlet of the cyclone dust collector is oriented in a coaxial direction relative to the air outlet.

Further, in a cyclone vacuum cleaner according to the fifth preferred embodiment, the air inlet of the cyclone dust collector is oriented in a non-coaxial

direction relative to the air outlet.

If the air inlet of the cyclone dust collector is in a non-coaxial orientation relative to the air outlet, it is preferable that the air path of the cyclone dust collector is skewed.

## BRIEF DESCRIPTION OF THE DRAWING FIGURES

These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims, and accompanying drawings where:

Fig. 1 is a perspective view of a vacuum cleaner having a conventional cyclone dust collector;

Fig. 2 is a side view of a cyclone dust collector disposed between an operation handle and a flexible hose assembly, according to the first preferred embodiment of the present invention.

Fig. 3 is a partially cut-away plan view showing a structure of a dust receptacle of the cyclone dust collector of Fig. 2.

Fig. 4 is a side view of the cyclone dust collector shown disposed in the middle of the flexible hose assembly, according to a second preferred embodiment of the present invention.

Fig. 5 is a perspective view of a vacuum cleaner with the cyclone dust collector disposed between the main body and the flexible hose assembly, according to a third preferred embodiment of the present invention.

Fig. 6 is a side view of the main body of a vacuum cleaner according to a fourth preferred embodiment of the present invention.

Fig. 7 is a side view of the main body of a vacuum cleaner according to a fifth preferred embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, preferred embodiments of a cyclone vacuum cleaner according to the present invention will be described in detail with reference to the accompanying drawings.

Figs. 2 through 4 show a cyclone dust collector disposed between an operation handle and a flexible hose assembly. Portions having the same objective and structure and identifying essentially identical elements as the prior art will be referred to by the same reference numerals.

Figs. 2 and 3 illustrate a first preferred embodiment of the present invention.

A cyclone dust collector 100 comprises a cyclone body 110, a dust receptacle

120, a dust separation grill 130, and first and second upstream prevention members 140, 150, respectively.

The cyclone body 110 forms an air whirlpool current with respect to air flowing into the body 110. It comprises an air inlet 111 fluidly communicating with the operation handle 23, and an air outlet 112 fluidly communicating with the main body 30 through a flexible hose assembly 24.

The dust receptacle 120 is removably connected to the cyclone body 110 by a locking unit 200. The locking unit 200 will be described in detail below.

The first upstream prevention member 140 is integrally formed with the dust receptacle 120 and provides a primary means for preventing dust collected in the cyclone body 110 from flowing into the main body 30.

The dust separation grill 130 extends downwardly in a direction away from the air outlet of the cyclone body 110, and has a plurality of fine holes 131 formed in a surface thereof.

The second upstream prevention member 150 is formed at the lower part of the dust separation grill 130, removed from the connection of the grill 130 to the cyclone body 110, and provides for providing secondary dust filtering, i.e., for separating dust which has not been filtered by the first upstream prevention member 140.

The cyclone dust collector 100 having the above structure is connected on one end of its structure to the operation handle 23 providing the air inlet 111, and at the other end is connected to the flexible hose assembly 24, providing the air outlet 112.

On the other hand, since the cyclone dust collector 100 is disposed between the operation handle 23 and the flexible hose assembly 24, the dust receptacle 120 may become obstructed by the operation handle 23 when separating the two. Therefore, the dust receptacle 120 is removably connected with the cyclone body 110 by the locking unit 200 so as to provide a structure not obstructed by the operation handle 23.

The locking unit 200 comprises a hinge projection 210 extending from the operation handle 23, and a hinge hole 220 formed in the dust receptacle 120 corresponding to the hinge projection 210 for cooperation therewith.

It is preferable that the hinge projection 210 extends from the lower surface of the operation handle 23. However, the hinge projection 210 can be formed on the side surface of the operation handle 23, if necessary or desired.

A connecting end of the dust receptacle 120 may be formed in the shape of an arc following an imaginary circle having a center or locus at the hinge projection 210, when viewed from above, as shown in Fig. 3.

It is preferable that the dust separation grill 130 does not exceed in length beyond

the connecting end, so that the rotation of the dust receptacle 120 is not obstructed.

Fig. 4 illustrates in a side view a second embodiment of the present invention, wherein the cyclone dust collector 100 is disposed in the middle of the flexible hose assembly 24 between two separated sections of hose. Again, like or similar elements are identified by identical reference numerals.

In this embodiment, the flexible hose assembly 24 is comprised of a first flexible hose 24a, one end of which is connected to the operation handle 23, and a second flexible hose 24b, one end of which is connected to the main body 30 of the cleaner. The cyclone dust collector 100 is disposed between the first and second flexible hoses 24a, 24b.

Therefore, it is possible to removably connect the dust receptacle 120 to the cyclone body 110 by means of the locking unit 200, which is comprised of the hinge projection 210 and the hinge hole 220. However, other appropriate connection means, such as a rotation connection system, which is the subject an application by the present applicant, disclosed in Korean Patent 2001-0046138 may also be used.

Fig. 5 illustrates a third preferred embodiment of the present invention, wherein the cyclone dust collector 100 is directly connected to the main body 30 of the cleaner. In this embodiment, one end of the cyclone dust collector 100, which is the air inlet, is

connected to the distal end of flexible hose assembly 24 furthest from the operation handle 23, and the other end, which is the air outlet, is connected to the main body 30. Since the cyclone dust collector 110 is fixed directly to the main body 30 in this case, cleaning work becomes easier since the combination of the cyclone dust collector 100 and main body 30 move together as one structure.

Figs. 6 and 7 show a fourth and the fifth embodiments of the present invention, respectively.

As shown in Figs. 6 and 7, a cyclone dust collector 300 comprises a cyclone body 310 and a dust receptacle 320. The cyclone dust collector 300 comprises an air inlet 311 connected to the flexible hose assembly 24, and an air outlet 312 connected to a suction port 31 of the main body 30. The dust receptacle 320 collects dust separated by an air whirlpool current, and is removably connected to the cyclone body 310, which itself is disposed above the main body 30.

In the cyclone body 310, as in Fig. 6, the air inlet 311 can be disposed in a coaxial orientation relative to the air outlet 312. The air inlet 311 can also be disposed in a non-coaxial orientation relative to the air outlet 312, as shown in Fig. 7.

Hereinafter, the operation of the cyclone vacuum cleaner according to the present invention will be described with reference to the accompanying drawings.

Suction force is generated by a suction motor as power is applied, and then air, including entrained dust, is drawn into the cyclone dust collector 100 through a brush 10, which draws in dust located on an area to be cleaned, and then through an operation handle 23. Then, the air is directed to the air inlet 111 of the cyclone body 110, which creates a downwardly directed whirlpool current guided by an air path forming body.

As the centrifugal rotation force of the air whirlpool current increases, even fine dust entrained in the air can be separated from the rotating air whirlpool current. The separated dust descends along the inside wall of the cyclone body 110 and is collected in the bottom of the dust receptacle 120.

The downwardly directed air whirlpool current, from which dust is now removed, reverses direction from the bottom of the cyclone body 110, and forms an ascending current rotating with a smaller radius within the outer, downwardly directed air current. Here, if the rotation force of the air whirlpool current increases, turbulence, which is normally generated in the bottom of the cyclone body 110 as the air current reverses direction, can be reduced. Accordingly, an air whirlpool current can be generated which can separate dust from the air more effectively. The ascending current passes through the dust separation grill 130, and then flows through the flexible hose assembly 24 into a dust collecting chamber (not shown) located in the main body 30 (Fig. 1).

Meanwhile, dust which is collected in the dust receptacle 120 may also ascend together with the ascending current. However, relatively large particles of dust cannot pass through the holes 131 of the dust separation grill 130, and the large dust particles drop to the bottom of the dust receptacle 120.

The remaining procedures at the dust collecting chamber in the main body 30 are performed in a conventional manner as those of a general vacuum cleaner, and are not further described herein.

When cleaning narrow spaces, accessory brushes 40, such as a crevice tool, can be directly connected to the operation handle 23 instead of being connected to an end of an extension pipe 11.

According to the preferred embodiment of the present invention, accessory brushes can be directly connected to the operation handle 23, and therefore, inconvenience resulting from having to carry a heavy extension pipe can be reduced.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.